**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

In re application of | Docket No: Q64544

Dominique HAMOIR

Appln. No.: 09/856,362 | Group Art Unit: 2633

Confirmation No.: 6876 | Examiner: Leslie PASCAL

Filed: May 22, 2001

For: AMPLIFICATION FOR VERY BROAD BAND OPTICAL FIBER TRANSMISSION SYSTEMS

**APPEAL BRIEF UNDER 37 C.F.R. § 41.37**

**MAIL STOP APPEAL BRIEF - PATENTS**
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the provisions of 37 C.F.R. § 41.37, Appellant submits the following:

## I. REAL PARTY IN INTEREST

The real party in interest is Alcatel, the assignee of the application.

## II. RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

## III. STATUS OF CLAIMS

Claims 1-8 and 10-25 are pending in the application.

Claims 24 and 25 are rejected under the first paragraph of 35 UC 112 as not supported by an enabling disclosure.

Claims 1-6, 11-18, 21 and 22 are rejected under 35 USC 103(a) as unpatentable over Saleh (USP 6,587,241).

Claims 7, 8, 10, 19, 20 and 23 are rejected under 35 USC 103(a) as unpatentable over Saleh in view of Chraplyvy (EP 0749224)

## IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the final Office action mailed January 11, 2006.

## V. SUMMARY OF THE CLAIMED SUBJECT MATTER

The invention is directed to a very wideband optical transmission system. In the paragraph beginning at line 10 of page 4 of the specification, the term "very broad band" is defined as meaning wavelength ranges that extend over more than 150 nm or over more than 20 THz. In a more common narrowband optical transmission system, it is known that the Raman effect will cause the gain of channels to be sifted, e.g., such that a spectrum presenting a plurality of channels at substantially identical power at the beginning will, after propagation, exhibit lower power levels for channels at shorter wavelengths. The present inventor has discovered a different phenomenon in a very broad band system. As described in the paragraph beginning at line 7 of page 8, when a spacing of at least 20 THz is maintained between channels, the cross-talk between channels is eliminated and the channels act as separate channels. But when the gap between bands is as low as about 13 THz, a different phenomenon takes place.

More particularly, as described in the paragraph beginning at line 5 of page 9, over a first zone at the lower end of the broad band, as shown in Fig. 1, the channels of a WDM multiplex are subject to depletion, which is most severe at the beginning of the zone and becomes very small nearest the second zone. In a third zone at the upper end of the very broad band, the channels are subject to enrichment, which begins very small at the end of the second zone and increases toward the end of the broad band. In the second zone between the first and third zones, the channels are enriched in connection with the depletion of the lower (first) zone channels and at the same time are depleted in connection with the enrichment of the upper (third) zone channels.

This description of the phenomenon which takes place is essential to an understanding of how the present invention works. Appellant has recognized that, in such a very broad band system, the power of the channels can be tailored to compensate for the depletion that occurs. Thus, for example, with depletion and enrichment occurring as shown in Fig. 1, a gain distribution as shown in Fig. 2 can be used which compensates for the enrichment and depletion.

There are a number of different ways to provide this compensation. As described at lines 5-26 of page 9, the present invention proposes to use distributed amplifiers with their gains set to achieve the desired gain curve as shown in Fig. 2. As described beginning at line 27 of page 9, the present invention proposes to use lower power levels in the third zone than in the other zones. Another solution is that, recognizing that a fiber exhibits increased linear losses at higher wavelengths, the system may employ an extended transmission window to ensure that there are significant linear losses that can help compensate for Raman depletion (e.g., claim 24). A third possible solution would be to use attenuators in this third zone. All of these techniques will compensate for enrichment of the channels over the end of the very broad band (e.g., claim 8). The use of distributed amlifiers or reliance on linear losses of the fiber will compensate in a distributed way (e.g., claim 25). The "means for compensating" recited in claim 1 encompasses these techniques and their equivalents.

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The grounds of rejection to be reviewed on appeal are:

1. Whether claim 24 is supported by an enabling disclosure.
2. Whether claim 25 is supported by an enabling disclosure.
3. Whether claims 1-6, 11-18, 21 and 22 are unpatentable over Saleh.
4. Whether claims 7, 8, 10, 19, 20 and 23 are unpatentable over Saleh in view of Chraplyvy.

## VII. ARGUMENT

### 1. Claim 24 is Supported By an Enabling Disclosure.

In the final Office action mailed January 11, 2006, the examiner has explained the basis for his rejection as follows:

> 2. Claims 24-25 are rejected under 35 USC 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such as way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. In regards to claim 24 (as in previous claim 9), it appears that there is no separate means that provides compensation. How can a single means cause the problem AND fix the problem? THE APPLICANT ONLY CLAIMS ONE MEANS IN THE CLAIM. It is a fiber. It is unclear how the applicant can argue that this is not a single means claim, if there is only one means. See MPEP 2164.08(a). In regard to claim 25, it is unclear how the attenuation is done in a distributed way. The attenuation is not distributed.

As to enablement of claim 24 aside from the "single means" issue, the specification describes the system in significant detail, and the undersigned does not see what in particular the examiner believes the ordinary artisan would not be able to do. Each individual component of the system is known, including the transmission fibers, the Raman amplifiers either discrete or distributed, optical signal transmitters having controllable transmission power, etc. What applicant has discovered is that a fiber previously thought useful only for a narrow band can be used in a very broad band system and there will be advantages heretofore not appreciated. There are no claims in this application directed to the fiber itself, but all claims are directed to a very broad band WDM transmission system or very broad band optical amplification system. Applicant has discovered that compensation will be required for depletion of the channels at the beginning of the broad band. There will also be both enrichment and depletion of channels by the Raman effect in a central zone. And there will be enrichment of the channels in the upper (third) zone near the end of the broad band. Applicant has devised a system design wherein these depletions and enrichments are compensated over the very broad band, and has explained in significant detail how to do it. In the particular case of claim 24, the specification describes

that the fiber itself will provide some compensation for enrichment in the upper region of a very broad band if the very broad band is positioned correctly relative to the region of increased linear losses in the fiber, e.g., such that the upper region of the very broad band is in the range above 1600 nm for the case of a conventional G.652 fiber, as described at page 10 of the specification.

The examiner has not seemingly questioned whether one of skill in the art would be able to provide an optical fiber which carries signals subject to the Raman effect. He has not in fact questioned whether one of ordinary skill in the art would be able to provide a fiber that has linear losses which compensate for enrichment of channels over the very broad band. What he has in fact questioned is the propriety of reciting only a single "means" in claim 24. But the examiner's position on this is simply wrong. Even a cursory glance at claim 24 shows that it does not contain the word "means" anywhere in the claim. Thus, any case law or MPEP authority relating to single means claims is simply not applicable.

Applicants pointed out to the examiner that the "single means" prohibition arises from the fact that the sixth paragraph of 35 USC 112 explicitly permits the use of means plus function language to recite an element in a claim to a *combination* of elements, so that "means plus function" language is only permitted in claims to a *combination* of elements, and cannot be used if there is only one element. In the Advisory Action mailed July 28, 2006 the examiner quotes a passage from *In re Hyatt* which is consistent with that, the court holding that since the claim in question used "means plus function" language it was assumed that the claim was intended to be to a combination of elements, and since only one means was recited, the claim was indefinite. That entire discussion is irrelevant to the present case where no means plus function language is used.

**2. Claim 25 is Supported By an Enabling Disclosure.**

The examiner has not argued the "single means" problem for claim 25, but has instead argued that it is unclear how the attenuation is done in a distributed way. However, the paragraph ridging pages 9-10 of the present application (the paragraph beginning "In the above-defined third zone,") explains that enrichment compensation is achieved by providing a gain less

than the average gain and/or by extending the transmission window so as to encounter increased linear losses in the fiber, which is also clearly distributed attenuation. What the examiner appears to be troubled by is not whether one of skill in the art could actually achieve the distributed attenuation, but rather how one would do it using the same fiber that is the cause of the Raman effect in the first place. But this is all clearly described in the specification. The examiner has not identified anything that the artisan could not do, but simply does not seem to like the fact that the claim does not explicitly recite a separate means for the compensation. But one of the features of the invention which is the focus of claim 25 is just that, i.e., the fiber itself can provide the compensation if the system is designed properly. And how to properly design the system is described in great detail in the specification.

**3. Claims 1-6, 11-18, 21 and 22 Are Not Unpatentable Over Saleh.**

Saleh discloses, inter alia, optical protection methods, systems and apparatus. According to Saleh, it is not uncommon for failures to occur in links along a transmission path, and at least one redundant path is provided between the origin and the destination nodes. As a result, when a failure occurs, the information is switched from a working path to a protection path. Saleh's purpose is to provide effective protection with increasing wavelength efficiencies for use in long distance communication systems.

As shown in Fig. 1 of Saleh, optical amplifiers 12 provide partitioned optical signal amplification in a plurality of wavelength groups $\lambda G$. The gain provided to signal wavelengths $\lambda i$ by the amplifier 12 is partitioned by wavelength groups $\lambda G$. Consequently, if an amplifier power supply fails for one wavelength group, the remaining amplifier power supplies continue to function and provide optical amplification for the remaining, or surviving, wavelength groups (Saleh, col. 6, lines 7-13).

Thus, Saleh focuses on the redundant path between the origin and destination nodes. Saleh does not mention at all the energy transfer between channels caused by the Raman effect over the very broad band.

The examiner has acknowledged that Saleh does not teach or suggest the causes of the attenuation to which the present invention is directed. However, the examiner argues that the Raman effect is caused by using wavelengths in the very broad wavelengths together, and that in partitioning wavelengths into bands with separately controllable gains it would have been obvious to compensate for Raman effect. Appellant respectfully disagrees. Saleh does not realize the special characteristic of energy transfers between channels caused by the Raman effect over the very broad band, it is not possible for Saleh to compensate for, theoretically or practically, the energy transfer caused by the Raman effect. There is no mention anywhere in Saleh of the concept of energy transfers between channels caused by the Raman effect, so there is nothing to suggest taking this into account when designing any other part of the system. So even if the hardware in Saleh were capable of being used in such a way as to satisfy the present claims, there would have been nothing to suggest this and therefore no basis for an obviousness rejection.

Saleh teaches the use of different transmission windows, suggesting a window as low as 1300 nm and a window as high as 1600 nm. And the gain in each "group" can be controlled independently. But there is no discussion of normalizing the transfer characteristics of the different wavelength groups, nor is there any discussion of the enrichment and depletion problems that arise due to Raman effect. For example, claim 1 of the present application describes the system as including means for compensating for energy transfers between channels caused by the Raman effect over the very broad band. In the present application, it is explained that the energy transfers will be of different types in different wavelength regions, and each is compensated for in an appropriate way. The compensation means can be amplifiers, attenuators or even extending the operating range into an area that might not otherwise have been used and thereby obtaining attenuation.

The examiner has already acknowledged that Saleh does not discuss the problem to which the present invention is addressed. So the invention is taught only if Saleh teaches something that would inherently result in the claimed invention. At lines 35-65 of column 5,

Saleh teaches that an amplifier 12 may provide "partitioned optical signal amplification" whereby the gain provided to one group of signal wavelengths is substantially independent of the gain provided to another wavelength group so that if the amplifier fails in one wavelength group, the amplification of other wavelengths group will not be degraded. This is discussed some more at lines 48-60 of column 7. But Saleh says nothing about having the gain in a lower part of the overall range of wavelengths be significantly higher than the average of the gains in the other wavelengths. Saleh does not know about applicants' reason for doing it, and there is no other reason given. So even if Saleh could control the gains of his amplifiers in such a way as to compensate for Raman effects over the very broad band that applicant has recognized, there is no suggestion to do so and no apparent reason to do so absent the teaching of the present application. It is not enough that the prior art could have been used in a manner which would have satisfied the claims, but there must be some clear direction to do so. This is entirely lacking here.

The examiner cites to lines 3-10 of column 7, but that simply describes the different types of amplifiers that can be used in different bands, with no discussion of having a gain in the lower region of a very broad band that is less than in the rest of the region. Indeed, Saleh is not even talking about a very broad band here, but simply different wavelength groups all of which may fit in a 1520-1565 band as described at lines 1-2 of column 8.

The examiner next cites to lines 20-24 of column 8 as allegedly teaching different gains for different bands, but it teaches no such thing. It merely mentions that there can be four wavelength groups each pumped by a different pump wavelength. It does not say that the gains will be or should be different. And like before, the patentee is still here talking about multiple groups within a narrowband system, so whatever gain differences might be contemplated have nothing to do with a higher gain over a lower region of a very broadband system.

The examiner next cites to lines 33-42 of column 10. Again, there is discussion of various types of amplifiers, but nothing about gain variations between amplifiers. The closest such statement would be the statement that each parallel amplifier can be optimized for a

particular signal wavelength group passing through it. Optimization could mean efficiency, less distortion at particular wavelengths, better linearity, etc. This is a discussion about optimizing the type of amplifier for its particular wavelength, not the gain of the amplifier. If gain were the optimization the patentee were talking about, it would be independent of the type of amplifier.

Appellant recognizes that Saleh does contemplate that the provision of separate amplifiers allows for different gain controls. The patentee mentions the possibility of different gain profiles at line 53 of column 3. But the possible different gains are simply a reflection of the broad concept of having gain tailored to the signals being amplified. The ordinary artisan might think that means that for signals in the 1550 nm range the gain should be "X" and for signals in the 1300 nm range the gain should be "Y". There is no recognition that when you add another operation band at 1400 nm, the gain "X" that was thought to be appropriate for the 1550 nm range will now have to be changed to compensate for depletion that occurs over a very broad band when the spacing between the bands is not enough, as discussed at page 8 of the present application. Page 8 of the present application points out that the Raman effect problem is at its worst when the spacing between bands is about 13 THz, and is non-existent when the spacing is more than 20 THz. There is no evidence that Saleh even knows it exists, much less where and under what circumstances. To say that an ordinary artisan reading Saleh would not only implement a very broadband system but would do it in such a way as to compensate for problems that only the present application has explained how to fix is simply going too far.

Appellant has recognized a problem, has studied it to understand it, and has proposed a solution enabled by that understanding. No one else, including the cited art, has explained the problem or proposed a solution.

At page 6 of the Remarks in the Office action, the examiner again characterizes Saleh as teaching different Raman gain for different wavelength ranges, but lines 53-57 of column 7 do not say this. The examiner states that Saleh "uses distributed amplifiers (column 6, lines 65-column 7, line 2) for compensation." But this is not true. Saleh teaches using distributed

amplifiers for amplification, and that is all that the passage describes. There is not one word anywhere in Saleh about compensation, much less compensation for Raman effects.

Why does applicant's Raman amplifier provide compensation when Saleh's would not? Because applicant's Raman amplifier has had its gain set to compensate for the Raman effect. Note that this is not simply a setting of the gain in a particular region. It is a setting of the gain in a particular region relative to the gains in the rest of the very broad band. Setting the gain in a particular region is, by itself, simply a chosen gain. But in an example given in the present application, setting the gain to a level that is initially 20dB higher and then over the next 80 nm decreases to the average level over the rest of the band as shown in Fig. 2 and described at page 9 of the present application, compensates for the Raman effect.

Saleh does not focus at all on a very broadband system or its problems. At the top of column 8, Saleh first describes an operating range of wavelengths of 1520-1565 nm, which is clearly not very broad band. At lines 7-10 of column 8, Saleh talks about extending that operating range to 1520-1620 nm, but even this extended range is clearly less than the 150 nm minimum defined for a "very broad band" system as defined at lines 10-15 of page 4 of the present application. It is only at the bottom of column 8 where the patentee suggests the possibility of transmission windows in each of the 1300, 1400 and 1600 nm ranges, but there is no suggestion in this brief discussion of any reason to have the gain of the amplifiers in the lower range be much higher than the average for the rest of the overall band, nor is there any suggestion that it would be advantageous to use less gain, lower signal power (different from less amplifier gain), attenuators, or making use of increased linear losses in the upper wavelength range not heretofore useful (note that Saleh only suggests using these non-typical wavelength bands if improved fibers have substantially decreased loss in such regions (see, e.g., lines 45-50 of column 8). This certainly does not suggest extending the operation up into a higher range to take advantage of increased loss.)

### 4. Claims 7, 8, 10, 19, 20 and 23 Are Not Unpatentable Over Saleh in View of Chraplyvy.

Saleh does not teach compensating for depletion over a range of 13-21 THz as recited in claims 6 and 15 or compensating for enrichment over a bandwidth of 13-21 THz at the upper part of the band as recited in claims 8 and 20. The examiner has not discussed any of these claims in his rejection, but simply cites Chraplyvy. But even at best, Chraplyvy never mentions such specific ranges.

The examiner has cited a reference which, if one were armed with the teaching of the present application, ***might*** be capable of being designed and operated in a way that would achieve the invention claimed. But there is no direction to do so. And the examiner has not given any reason the artisan would have been led to setting up the Saleh system so that the very broad band would be used, it would be positioned such that the attenuation in the upper region would be provided by the particular fiber used, the amplifier gains in the lower and upper regions would be adjusted to compensate for Raman effect depletion or enrichment, etc. The simple fact that the Saleh system *could be* set up that way is not evidence that it would have been obvious to do it. That is not a proper standard for obviousness.

## CONCLUSION

The examiner has rejected claims 24 and 25 for lack of enablement but has not pointed to a single thing that is recited in the claim that the artisan could not do. His entire objection to these claims is based on a mistaken belief that they are impermissible single means claims. As to the prior art rejections, the examiner has not cited art that teaches what appellant discloses and claims, and the examiner has acknowledged as much. And the claimed invention would not inherently result in what the prior art teaches, or the rejection would have been for anticipation. The examiner has also cited no art that even recognizes the problem to which the present invention is addressed. The result is that the claimed invention cannot be unpatentable over this art unless there is some direction in the art which, even though directed to some other problem than that to which the claimed invention is directed, would result in the artisan modifying the

Saleh system such that it would include all of the limitations of the rejected claims. There is no such direction. "Partitioned" gain does not teach one to provide gain curves in the lower and upper regions which compensate for the depletion curve in lower region and enrichment curve in the upper region. The examiner has not presented a prima facie case for unpatentability, but rather a case built on knowledge of the present application. Accordingly, it is submitted that the rejections are not supportable and should be reversed.

Respectfully submitted,

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## CLAIMS APPENDIX

CLAIMS 1-8 AND 10-25 ON APPEAL:

1. A very broad band wavelength division multiplexed transmission system comprising optical media for carrying a single continuous very broad band of signals subject to a Raman effect, said system further comprising means for compensating energy transfers between channels caused by the Raman effect over the very broad band.

2. The system of claim 1, characterized by a bandwidth greater than 20 THz.

3. The system of claim 1, characterized by a bandwidth greater than 30 THz.

4. The system of claim 1, characterized in that said band extends beyond 1620 nm.

5. The system of claim 1, characterized in that the compensation means compensate depletion in channels over the beginning of the band.

6. The system of claim 5, characterized in that the compensation means compensate depletion in the channels at the beginning of the band over a bandwidth lying in the range 13 THz to 21 THz.

7. The system of claim 1, characterized in that the compensation means compensate enrichment of channels over the end of the band.

8. The system of claim 7, characterized in that the compensation means compensate enrichment of the channels over the end of the band over a bandwidth lying in the range 13 THz to 21 THz.

9. (Cancelled).

10. The system of claim 7, characterized in that the enrichment of channels over the end of the band is compensated for by the system using lower powers for channels near the end of the band than for channels elsewhere in the band.

11. A very broad band optical amplification system comprising optical media for carrying a single continuous very broad band of signals subject to a Raman effect, said system further comprising compensation means for compensating energy transfers between channels caused by the Raman effect over the very broad band.

12. The system of claim 11, characterized by a bandwidth greater than 20 THz.

13. The system of claim 11, characterized by a bandwidth greater than 30 THz.

14. The system of claim 11, characterized in that the compensation means compensate depletion in the channels over the beginning of the band.

15. The system of claim 14, characterized in that the compensation means compensate depletion in the channels over the beginning of the band over a bandwidth lying in the range 13 THz to 21 THz.

16. The system of claim 14, characterized in that it comprises distributed amplification means over the beginning of the band.

17. The system of claim 16, characterized in that the distributed amplification means comprise Raman amplification means.

18. The system of claim 16, characterized in that the distributed amplification means comprise rare earth amplification means.

19. The system of claim 11, characterized in that the compensation means compensate enrichment of the channels over the end of the band.

20. The system of claim 19, characterized in that the compensation means compensate enrichment of the channels over the end of the band over a bandwidth lying in the range 13 THz to 21 THz.

21. The system of claim 1, characterized in that said band extends beyond 1650 nm.

22. The system of claim 1, characterized in that said band extends beyond 1670 nm.

23. The system of claim 7, characterized in that the compensation means comprise at least one attenuator.

24. A very broad band wavelength division multiplexed transmission system comprising an optical fiber for carrying a single continuous very broad band of signals subject to a Raman effect, wherein the optical fiber further provides linear losses to compensate enrichment of channels over the end of the very broad band.

25. The system of claim 19, wherein the compensation means attenuate the enrichment of the channels over the end of the very broad band in a distributed way.

## EVIDENCE APPENDIX:

There is no evidence submitted pursuant to 37 C.F.R. §§ 1.130, 1.131, or 1.132 or any other evidence entered by the Examiner and relied upon by Appellant in the appeal.

## RELATED PROCEEDINGS APPENDIX

There are no decisions rendered by a court or the Board in any proceeding identified about in Section II pursuant to 37 C.F.R. § 41.37(c)(1)(ii).